actualized because it is unnecessary to install image pickup devices corresponding amounts of electrostatic field generating interspaces.

In more preferred embodiment of the invention, a quite excellent advantage is obtained that a downsizing of an entire electrostatic levitation furnace is actualized and in addition each of position information of samples levitated in a plurality of electrostatic field generating interspaces respectively can be sampled at high velocities.

What is claimed is:

1. An electrostatic levitation furnace comprising a vacuum chamber, main electrodes opposed to each other within the vacuum chamber, an auxiliary electrode which moves a sample levitated due to electrostatic field generated between the main electrodes to a predetermined position, and a laser irradiator which irradiates a laser beam on the sample displaced the predetermined position to melt the sample, wherein a plurality of the main electrodes are arranged at proper intervals in vertical direction to form electrostatic field generating interspaces between the adjacent main electrodes respectively, the auxiliary electrodes are arranged to correspond to each of the electrostatic field generating interspaces, the laser irradiators are arranged both of above the main electrode positioned at uppermost and under the one positioned at lowest to be opposed to each other coaxially, and the main electrode positioned midway between the

uppermost one and the lowest one has a through-hole on optical path of laser beam which a sample can be passed through.

2. An electrostatic levitation furnace comprising a vacuum chamber, main electrodes opposed to each other within the vacuum chamber, an auxiliary electrode which moves a sample levitated due to electrostatic field generated between the main electrodes to a predetermined position, and a laser irradiator which irradiates a laser beam on the sample displaced the predetermined position to melt the sample, wherein a plural pairs of the main electrodes forming electrostatic field generating interspaces are arranged as stacking in a vertical direction, the auxiliary electrodes are arranged to correspond to each of the electrostatic field generating interspaces, the laser irradiators are arranged both of above main electrode positioned uppermost and under the one positioned lowest to be opposed to each other coaxially, and the main electrode positioned midway between the uppermost one and the lowest one has a through-hole on optical path of laser beam which a sample can be passed through.

3. An electrostatic levitation furnace according to claim 1 or 2 wherein an image pickup device comprising a CMOS camera or a CCD camera photographing a sample, a background light source irradiating a light on a sample, and a digital signal processor executing image

processing which enhances the edge of an image in real time and outputting a position of the center of gravity of a sample put in a levitation state is provided so as to extend to adjacent electrostatic field generating interspaces.

4. A method for fusing samples together using an electrostatic levitation furnace, comprising, in fusing a plural species of samples all together using an electrostatic levitation furnaces according to any one of claim 1 to 3;

a step for levitating a first sample on a optical path of a laser beam in either of electrostatic field generating interspaces and subsequently irradiating a laser beam on the first sample from a laser irradiator at the side of one main electrode to melt the sample;

a step for, while levitating a first sample maintained in a melted state by irradiating a laser beam on the first sample, levitating a second sample on a optical path of a laser beam in another electrostatic field generating interspace and subsequently irradiating a laser beam on the second sample from a laser irradiator at the side of the other main electrode to melt the sample;

a step for moving the sample positioned in upper one of the electrostatic field generating interspaces which levitate the first and the second samples in melted states respectively from the upper electrostatic field generating interspace through a through-hole of a

main electrode positioned midway to the lower electrostatic field generating interspace while controlling the temperature, position, and fall velocity of the sample, and subsequently fusing the samples in melted states together while levitating them;

a step for stopping both of irradiation of laser beam from the upper and the lower laser irradiators to solidify a fused body from the first and the second samples, and subsequently moving the fused body at a predetermined position in the lower electrostatic field generating interspace, wherein a plural species of samples are fused all together through the above-mentioned steps.

Abstract

The present invention is an electrostatic levitation furnace which is provided with a vacuum chamber, main electrodes opposed to each other within the vacuum chamber, an auxiliary electrode moving a sample levitated by an electrostatic field generated between the main electrodes, and a laser irradiator irradiating a laser beam on a sample displaced at a predetermined position, wherein a plurality of the main electrodes are arranged at proper intervals in a vertical direction to form electrostatic field generating interspaces between the adjacent the main electrodes respectively, auxiliary electrodes are arranged to correspond to each of the electrostatic field generating interspaces, the laser irradiators are arranged both of above the main electrode

positioned uppermost and under the main electrode positioned lowest so as to be opposed to each other coaxially, and the main electrode positioned midway between the uppermost one and the lowest one has a through-hole on optical path of laser beam which a sample can be passed through. The electrostatic levitation furnace, for example, when two species of samples are fused together, regardless of whether or not the samples are conductors, has the function of melting the samples being levitated individually and fusing them together while maintaining each of the temperatures of the samples, and consequently this enables to actualize a fusion in a state excluded external interference.